

illustrated and described by Dr. Drake-Brockman. He tells us some new things about the long-necked, long-tailed dibatag (*Ammodorcas*) and gerenuk (*Lithocranius*), and about the oryx. In this last type (of which the book gives an excellent photograph) the reader is recalled to one of the problems of faunistic geography as yet unsolved, *i.e.* why is there such a strong affinity in mammalian and bird fauna, and to a lesser extent in flora, between south-west and north-east Africa, between Somaliland (in its largest geographical extent) and Trans-Zambezia? The Beisa oryx of north-east Africa and the Cape gemsbok are more nearly allied than either is to the fringe-eared oryx (*O. callotis*) of East Africa. In both north-east and south-west Africa we have ostriches, aard-wolves, otocorys, gazelles, foxes, black-backed jackals, secretary birds, striped hyenas, caracal lynxes, and cheetahs. North of the Zambezi and the Zambezi-Kunene line they do not exist, nor south of the Tana River and the Anglo-German frontier in Masailand.

There is even a slight correspondence (in these geographical extremes of Africa) in the affinities of the lowest human types. Linguistically, the only allies of the south-west African Hottentots are in equatorial German East Africa, and physically the only resemblances to the Bushman are to be met with in some of the Andorobo, Suk, and Doko helot tribes of north-east Africa, north and east of Unyamwezi and the Kilimanjaro district. Why should the connecting links of so many mammal and bird types have died out in between? The intervening regions were almost certainly covered down to quite recent times by dense forest, a forest only abated by the Neolithic negro. How did the "desert" types referred to of Somaliland and south-west Africa work their way through this forest-land across many degrees of latitude, and yet retain their peculiar adaptability (in colour as well as peculiarities of hoof and habit) for arid countries? A similar problem remains unsolved in regard to South America, in the south-western parts and southernmost extremity of which continent there are mammals related to North American types (such as Andean bear, the Antarctic wolf, and the *Auchenia* camelids) the nearest affinities of which are with North American forms, yet which to reach their present habitat must have traversed a greater or less breadth of densely forested, steamingly hot equatorial America.

H. H. JOHNSTON.

SOME BRITISH FRESH-WATER PROTOZOA.

British Fresh-water Rhizopoda and Heliozoa. Vol. II. Rhizopoda, Part II. By the late James Cash, assisted by John Hopkinson. Pp. xviii + 166 + 32 plates. (London: Ray Society, 1909.) Price 12s. 6d. net.

THE appearance of the second volume of this useful monograph of the British Rhizopoda was heralded some few months ago by the sad announcement of the death of the author, Mr. James Cash. The descriptions of the species and the beautiful plates which illustrate them were from the hand of the devoted and enthusiastic Manchester microscopist, and it will always be a matter for sincere regret that his life was not spared to see the completion of his work.

To Mr. John Hopkinson we are indebted for the notes on synonymy, for the bibliography, and for the responsibility of seeing the volume through the press after the death of Mr. Cash.

The genera dealt with in the present volume are those included in the divisions of the Conchulina called by the authors the Diffflugina and Nebelina. This leaves the treatment of the testaceous forms with filamentous pseudopodia and the Heliozoa to a third volume.

As pointed out in our review of the first volume (May 17, 1906), this monograph is one that is essentially systematic in its treatment. It includes the description of a number of forms which are considered by those who have made a special study of them to be specifically distinct or to be racial varieties of distinct species, but it does not attempt to deal with the more difficult problems of life-history and the influence of the environment. To the working microscopist who is anxious to find names for the varieties he discovers in the fresh-waters that he visits it will doubtless be of some value, for it gives him, in a convenient form and with excellent illustrations, a statement of the names that have been given to the varieties of *Diffflugia*, *Lesquereusia*, *Quadrula*, and other well-known genera. But a purely systematic work of this kind cannot fail to raise in the mind of an inquirer many interesting questions that it altogether fails to satisfy. For example, of the genus *Diffflugia* alone no fewer than twenty-three species are described, varying in length from 15μ to 250μ . Is there really any satisfactory evidence to prove that the smaller forms, such as *D. penardi* and *D. globulosa*, are not the younger stages in the growth of the larger forms? In the closely allied genus *Centropyxis*, Schaudinn has proved that the zygote formed by the fusion of a megagamete and a microgamete forms a small shell, but no one has, at present, described in detail the characters of the shells of the different stages of growth from the zygote until the full size of the adult is attained. Until this has been carefully done by the culture method, with two or three examples, the real value of the specific characters used in systematic treatises must be accepted with very great hesitation. In the meantime, it might be of some assistance to zoologists if a naturalist endowed with the skill and patience of the late Mr. Cash would give us a census of the *Diffflugia* varieties or forms that are found in a particular pond or *Sphagnum* bog once for every month during a year or two. Such a census might, at any rate, suggest certain coincidences of occurrence which would be worthy of further investigation.

A few figures are given of two individuals "in conjugation" (*e.g.* *Diffflugia oblonga*, p. 13, *Cryptodiffflugia oviformis*, p. 79, *Nebela collaris*, p. 96), but the recent researches of protozoologists render it extremely improbable that a true process of conjugation occurs at all under such conditions as the figures indicate. It may be plastogamy or it may be a late stage of fission that has been observed, the absence of any indication of the nuclear structures in the figures rendering it impossible to form an opinion on this point, but there is really no reason to suppose that it is conjugation.

The volume is, as usual with the Ray Society's publications, well printed, copiously illustrated, and, thanks to the labours of Mr. Hopkinson, provided with very complete lists of reference to literature, and an index.

TECHNICAL CHEMISTRY OF SUGAR AND STARCH.

Traité complet d'Analyse chimique, appliquée aux Essais industriels. By Prof. J. Post and Prof. B. Neumann. Deuxième Édition Française entièrement refondue. Tome seconde, deuxième fascicule. (Paris: A Hermann et Fils, 1910.) Price 8 francs.

THIS edition of Post and Neumann's work is translated by MM. Pellet and Chenu from the third German edition. The particular fascicule now under notice deals with the chemical control of the manufacture of sugars and starches.

Beetroot sugar naturally claims the lion's share of attention in a Continental book dealing with sugar, and, by following the text in the case of this product, a good idea of the work as a whole will be obtained.

An outline of the process by which the sugar is extracted gives the reader in a page or two a general introduction to his subject. This leads to an exhaustive account of the various methods which are available for determining the quantity of sugar present in any solution of saccharine substances. Naturally, they are well-known processes—areometric, gravimetric, polarimetric, and volumetric; but they are well explained, both as regards theory and practice, and illustrated with figures of the requisite apparatus.

Coming next to the more specialised part of the work, we find, to begin with, detailed instructions for the testing of beetroot seed, and also specifications (German, Austrian, and French) of the conditions which the seeds are required to fulfil. Next follows a scheme for the analysis of the roots themselves, including full directions for those most important preliminary operations the sampling and pulping of the materials.

Having the pulp, what, precisely, is the best method of extracting the sugar from it? Much depends on this, and a full discussion of the *pros* and *cons.* of the various processes is entered into; namely, as to whether water or alcohol is the best solvent, whether it should be used hot or cold, and whether this or that *modus operandi* is to be given the palm for merit. Eventually the conclusion is arrived at, and supported by Dr. Herzfeld "*après de longues études*," that extraction with cold water is in every way preferable to the use of alcohol for the purpose. It is simpler, easier, quicker, more economical, and more exact.

The samples of roots being analysed *secundum artem*, and the proportion of sugar duly determined, we pass to the *jus de diffusion* obtained in the actual manufacture. This is a weak aqueous solution of sugar and other soluble matter extracted from the roots by diffusion in water, and full directions are given for its examination. Next the syrups and massecuites are dealt with, modified processes of analysis being used, to suit their more highly saccharine nature; and eventually the finished products—

the dry sugars and molasses—come under review. This, however, is not all; there is the question of by-products to be considered, including the best methods of utilising the residues from the pulp and molasses; and also there is the examination of the various materials, namely, water, chalk, carbonic acid, sulphuric acid, strontianite, and so on, that are used in the various stages of the manufacture.

These matters are all dealt with at length. Many figures of the necessary apparatus are given, and also several tables of numerical values which will much facilitate the analyst's work.

The remaining sections of the book, treating of cane-sugar, starch, dextrine, and glucose, are written in a similar practically useful manner. If in these industries, or in the future British beet-sugar production to which some hopeful eyes are turning, any chemist requires a laboratory handbook, he might do worse than study the one under notice. C. S.

PETROLEUM MINING AND OIL-FIELDS.

Petroleum Mining and Oil-field Development. A Guide to the Exploration of Petroleum Lands, and a Study of the Engineering Problems connected with the winning of Petroleum. By A. Beeby Thompson. Pp. xx+362. (London: Crosby Lockwood and Son, 1910.) Price 15s. net.

THE engineering part of the book contains a large amount of instructive information, especially in regard to customary procedure in Russian oil-fields, but the author betrays a lack of knowledge of recent practice in some of the American oil-fields. Thus, his remarks on steel wire cable drilling on p. 193 are misleading, for it is common knowledge that at the present time this system is certainly in favour in the United States, and may, in fact, be said to be generally used for deep wells in that country, often after a depth of 600 to 800 feet has been reached. Similarly, the statement made on p. 218, as to the method adopted when a dropped tool cannot be recovered by "fishing," ignores the usual practice of "side-tracking" by raising the casing and drilling off with a wedge. Again, on p. 238, the diameter of the last string of casing is understated, for American wells, started with a diameter of 12 inches or 14 inches, are frequently completed at a depth of 3000 feet, or even 4000 feet, with a diameter of 6 inches, and it is incorrect to state that in the United States the casing is always manufactured from mild steel, for wrought-iron casing is manufactured in that country and is readily obtainable. In the description of the process of cementing wells, on pp. 266-8, there is no mention of the latest and most effective system, which consists in pumping the fluid cement, without any admixture of sand, through tubing packed inside the casing, so that it circulates below the shoe and passes up on the outside of the casing, which is afterwards lowered and the packer withdrawn.

The description of fishing tools is a good and comprehensive account of these appliances, but generally the treatment of the engineering branch of the subject is unequal, and there is a predominance of the Russian practice, to which the author unconsciously